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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/717,881	11/19/2003	Steven Gianoulakis	A8431/T51500	9363

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EXAMINER

LUND, JEFFRIE ROBERT

ART UNIT PAPER NUMBER

1763

DATE MAILED: 10/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/717,881

Applicant(s)

GIANOULAKIS ET AL.

Examiner

Jeffrie R. Lund

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 5-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 5-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 5-9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams, US Patent 5,614,026.

Williams teaches a processing apparatus that includes: walls enclosing a process chamber 333; a susceptor 326 for supporting a wafer 108; a first exhaust conduit 318 in fluid communication with the chamber and adapted to receive a flow of radial exhaust gas; a processing gas source 300 in fluid communication with the chamber through a showerhead 370, which includes a first channel in fluid communication with the processing gas source and with apertures 360 distributed over the lower surface of the showerhead, and a second channel separate from the first channel and in fluid communication with a second exhaust conduit 364 and with exhaust apertures distributed over the lower surface of the showerhead; and the first exhaust conduit and the second exhaust conduit share a common exhaust line and pump. The apertures define a first area and the exhaust apertures define a second area and the ratio of the first area to the second area is substantially constant as a function of radial distance from the center of the gas distribution showerhead. (Entire document, specifically, figures 3a-3d)

Williams differs from the present in that Williams does not teach that the ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution showerhead.

Optimizing the size of the apertures of a showerhead is required in order to optimize the flow in the process chamber, and for each process in which the showerhead is used. It would be obvious to one of ordinary skill to vary the ratio of the first area to the second area as a function of the radial distance from the center of the gas distribution showerhead in order to optimize the flow of the process gas into and out of the chamber. Furthermore, it was held in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), by the Federal Circuit that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. (Also see MPEP 2144.04 (d))

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the ratio of the first area to the second area as a function of the radial distance from the center of the gas distribution showerhead in order to optimize the flow through the processing chamber of Williams.

3. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams, US Patent 5,614,026, in view of Adomaitis et al, WO 02/08487.

Williams was discussed above.

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Williams differs from the present in that Williams does not teach valves in the first and second conduits are connected to the common foreline via a first and second valve, or that the first and second conduits are connected to separate vacuum pumps.

Adomaitis et al teaches a processing apparatus that includes: walls enclosing a process chamber 10; a susceptor 18 for supporting a wafer 16; a first exhaust conduit is connected to a gate valve 20, V1CV1 in fluid communication with the chamber; a processing gas source 21 in fluid communication with the chamber through a showerhead 12, which includes a first channel 26 in fluid communication with the processing gas source and with apertures 30 distributed over the lower surface of the showerhead, and a second channel 34, separate from the first channel, and in fluid communication with a second exhaust conduit 35, a valve V2CV2, and with exhaust apertures 32 distributed over the lower surface of the showerhead; the first exhaust conduit is connected to a first pump; and the second exhaust conduit is connected to a second pump (figure 11). The apertures define a first area and the exhaust apertures define a second area and the ratio of the first area to the second area is substantially constant as a function of radial distance from the center of the gas distribution showerhead. (Entire document, specifically, figures 3a-3c, 4-7, and 11)

The motivation for adding the valves of Adomaitis et al to the first and second exhaust conduits of Williams is to control the flow of gases through the exhaust conduits.

The motivation for replacing the single pump of Williams with two pumps as taught by Adomaitis et al is to provide an alternate and equivalent means of exhausting

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the process gases. Multiple pumps allow the pumps to be specifically tailored to the flow requirements of each flow conduit.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add valves to the first and second exhaust conduits of Williams, and replace the single pump of Williams with two pumps as taught by Adomaitis et al.

4. Claims 1, 5-9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams, US Patent 5,614,026 in view of Muller et al, US Patent 6,537,418.

Williams teaches a processing apparatus that includes: walls enclosing a process chamber 333; a susceptor 326 for supporting a wafer 108; a first exhaust conduit 318 in fluid communication with the chamber and adapted to receive a flow of radial exhaust gas; a processing gas source 300 in fluid communication with the chamber through a showerhead 370, which includes a first channel in fluid communication with the processing gas source and with apertures 360 distributed over the lower surface of the showerhead, and a second channel separate from the first channel and in fluid communication with a second exhaust conduit 364 and with exhaust apertures distributed over the lower surface of the showerhead; and the first exhaust conduit and the second exhaust conduit share a common exhaust line and pump. The apertures define a first area and the exhaust apertures define a second area and the ratio of the first area to the second area is substantially constant as a function of radial distance from the center of the gas distribution showerhead. (Entire document, specifically, figures 3a-3d)

Williams differs from the present in that Williams does not teach that the ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution showerhead.

Muller et al teaches a gas distribution plate 60 that includes a first channel 72 in fluid communication with the processing gas source and with apertures 66, 66a distributed over a lower surface of the gas distribution plate, the apertures define a first area; and a second channel separate from the first channel and in fluid communication with a second exhaust conduit and with exhaust apertures 69, 69a distributed over the lower surface of the gas distribution plate. The second apertures 69, 69a define a second area and a ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution plate. (The ratio 66/69 at the center decreases as the radial distance increase from the center to the ratio 66a/69a at the edge of the wafer.) Muller et al also teaches:

“It is further contemplated that apertures 66 and channels 69 can have predetermined areas at predetermined locations on GDP 60 to adjust the flow at to accommodate different load conditions on the wafer. By creating a condition in which load conditions are accounted for in conjunction with uniform gas concentrations, an improved etching process is realized.”

The motivation for varying the ratio of the first area to the second area varies as a function of the radial distance from the center of the gas distribution showerhead of Williams as taught by Muller et al is to optimize the flow at to accommodate different loads conditions on the wafer to improved the etching process. Furthermore, it was

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held in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), by the Federal Circuit that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. (Also see MPEP 2144.04 (d))

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the ratio of the first area to the second area as a function of the radial distance from the center of the gas distribution showerhead in order to optimize the flow through the processing chamber of Williams as taught by Muller et al.

5. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams, US Patent 5,614,026, and Muller et al, US Patent 6,537,418 B1, as applied to claims 1, 5-9, and 11 above, and further in view of Adomaitis et al, WO 02/08487.

Williams and Muller et al differs from the present in that they do not teach valves in the first and second conduits are connected to the common foreline via a first and second valve, or that the first and second conduits are connected to separate vacuum pumps.

Adomaitis et al was discussed above.

The motivation for adding the valves of Adomaitis et al to the first and second exhaust conduits of Williams is to control the flow of gases through the exhaust

conduits.

The motivation for replacing the single pump of Williams and Muller et al with two pumps as taught by Adomaitis et al is to provide an alternate and equivalent means of exhausting the process gases. Multiple pumps allow the pumps to be specifically tailored to the flow requirements of each flow conduit.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add valves to the first and second exhaust conduits of Williams and Muller et al, and replace the single pump of Williams and Muller et al with two pumps as taught by Adomaitis et al.

Response to Arguments

6. Applicant's arguments filed September 14, 2006 have been fully considered but they are not persuasive.

In regard to the argument that Williams and Muller et al both teach away from a flow of radial exhaust gas by teaching that the gas flows perpendicular to the substrate, the Examiner disagrees. It is true that in both Williams and Muller et al both teach flows perpendicular to substrate, it is not true that they do not teach a flow of radial exhaust gas. Williams clearly teaches that the exhaust gas flows vertically from the chamber 320 through the various exhaust apertures and into the second exhaust conduit, and radially outward to exit the second exhaust conduit via exit 376. The first exhaust conduit then receives the flow of radial exhaust gas and removes the exhaust gases from the chamber. Thus, the first exhaust conduit is adapted to receive a flow of radial exhaust gas. Muller et al functions in the same basic way except that the flow of the exhaust is in

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a radially inward direction.

It appears that the Applicant is trying to claim a radial flow across a substrate. If this is the case, then the claims need to be amended to specifically point out the desired flow path (i.e. vertically from the showerhead to the surface of the substrate and radially across the substrate to the first exhaust conduit). The claimed flow path must be supported in the specification.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jeffrie R. Lund
Primary Examiner